Trend Study 11B-7-05

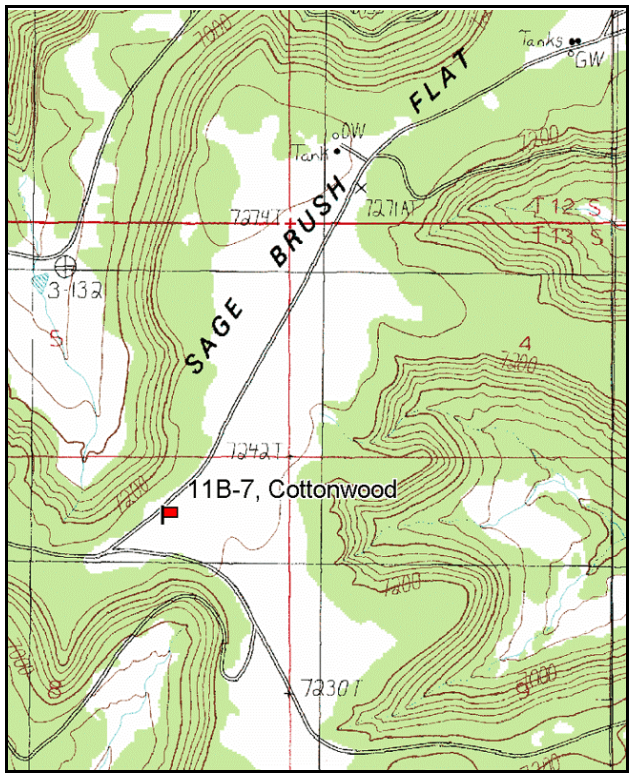
Study site name: Cottonwood . Vegetation type: Wyoming big sagebrush .

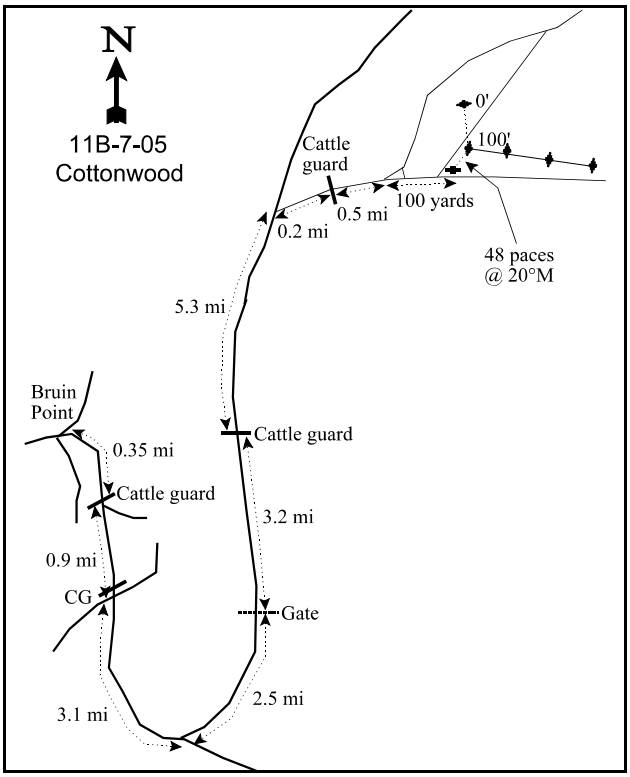
Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft).

LOCATION DESCRIPTION

At the Range Creek Summit (Bruin Point) take the middle fork and go 0.35 miles. Stay right at the fork just beyond a cattle guard and go 0.9 miles. Pass straight through an intersection beyond the next cattle guard and go 3.1 miles. Turn left at the fork and continue 2.5 miles. Pass through a gate near a cabin and continue 3.2 miles. Cross a cattle guard and proceed 5.3 miles on the main road. Bear right, cutting across the angle of a fork, and go 0.2 miles to a cattle guard. Continue 0.5 miles to another major fork. Stay right and go 100 yards to a rebar witness post on left side of the road. The 100-foot baseline stake is 48 paces at 20°M from the witness post. All markers are rebar, and the 0-foot end of the baseline has a browse tag #7872 attached.





Map Name: Twin Hollow

Diagrammatic Sketch

Township 13S , Range 16E , Section 8

GPS: NAD 27, UTM 12S 4396125 N, 573453 E

DISCUSSION

Cottonwood - Trend Study No. 11B-7

The study site samples a sagebrush flat at the northeast end of Cottonwood Ridge. The extensive sagebrush opening is surrounded by a mature pinyon pine woodland which gradually slopes down to steep canyons that drain east into the Green River. Terrain at the study site is nearly level (1% slope) with an elevation of 7,200 feet. A pellet group transect which runs north of the transect was read every year until 1989 when it was suspended. Data from the previous years was quite variable, but no use was the most common result. During the 12 years previous to 1989, deer did not use the area during most of the winters, and use ranged from 1 to 9 deer days use/acre (2 to 23 ddu/ha) during any one year. Correspondingly, few deer and elk pellet groups were found on the study site. Both deer and elk had the same quadrat frequency in 1994 (10%). Quadrat frequency of deer and elk pellet groups dropped in 2000 to only 1% deer and 6% elk, then in 2005 deer remained at 1%, but elk increased to 24%. Estimated pellet group data in 2000were 23 elk and 1 deer days use/acre (57 edu/ha and 2 ddu/ha). In 2005, the estimated pellet group data was 15 elk, 5 deer, and 2 cow days use/acre (38 edu/ha, 13 ddu/ha, and 5 cdu/ha). Cattle grazing pressure also appears to have been low during past readings and widely dispersed. As part of the Green River allotment, the area receives spring and summer cattle use. Sagegrouse droppings were also found on the site in 2005 at an estimated rate of 17 pellet groups/acre.

The soil is moderately deep and rocky with an effective rooting depth estimated at nearly 14 inches. There appears to be a layer of bedrock or a hardpan 12-16 inches below the surface. Deeper depth measurements were possible under sagebrush. The soil is a loam with a slightly alkaline soil reaction (7.4 pH). Phosphorus is limited at only 4.6 ppm, values less than 6 ppm may limit normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). Much of the soil surface was exposed in 1986 with 59% of the ground surface estimated as bare ground. Bare ground has continued to be moderately high with a relative bare ground cover of 48% in 1994, 35% in 2000, and 44% in 2005. Litter and cryptogamic cover is limited to the areas beneath the sagebrush canopy. There is some evidence of soil movement and soil pedestaling around sagebrush, but the flat terrain prevents severe erosion. The erosion condition class determined soil movement as stable in 2005.

This sagebrush flat is dominated by an overly mature stand of Wyoming big sagebrush which provided 14% cover in 1994, 16% in 2000, and 13% in 2005. The sagebrush density was estimated at 5,132 plants/acre in 1986, decreased in 1994 to 4,020 plants/acre, increased slightly in 2000 to 4,140 plants/acre, then decreased again in 2005 to 3,320 plants/acre. The percentage of decadent individuals in the population has fluctuated from 66% in 1986, to 35% in 1994, to 69% in 2000, to 50% in 2005. The percentage of dying individuals in the population has fluctuated as well (8% in 1986, to 14% in 1994, to 30% in 2000, to 13% in 2005). Recruitment has been poor since the first reading in 1986. Young individuals made up 9% of the population in 1986, but have stayed at or below 3% since 1994. Most years, utilization was moderate to heavy, except in 2005 when use was mostly light. The plants on this site produced limited new growth in the past readings and were not very vigorous, making hedging appear more severe.

Broom snakeweed, an increaser, occurs in the bare interspaces. It has fluctuated in density, has seemed to have a stable population, but decreased drastically in 2005. In 1994, the estimated density was 2,620 plant/acre, decreased to 1,680 in 2000, then drastically decreased to 440 plants/acre in 2005. Very few pinyon are found in the flat and they do not appear to be increasing. The surrounding woodland provides good thermal cover.

The grass component is very good and abundant for a Wyoming sagebrush type. Needle-and-thread and western wheatgrass were the dominant grass species in 2005. In the early years of the study site, grazing pressure was moderate, but historically the area was subjected to long periods of excessive use by livestock. Since 1994, with little to no livestock grazing, cover of perennial grasses has nearly tripled and frequency has

also increased. In 2005, cheatgrass was sampled for the first time on the site, but was only found in 2 quadrats.

Forbs are diverse and produced as much cover as the grasses in 1994. Due to dry conditions in 2000, the nested frequency of forbs declined and then was stable in 2005. The majority of the forbs are found growing within the protection of the sagebrush, except for the low rounded mats of desert phlox. None are particularly important. Lobe-leaf groundsel, scarlet globemallow, and desert phlox are the most obvious species. No annual forbs were sampled on the site until 2005, when Douglas knotweed was sampled.

1986 APPARENT TREND ASSESSMENT

The key species, Wyoming big sagebrush, shows a high incidence of decadence (66%) and poor vigor (32%), but the number of seedlings is high. Recruitment appears adequate to maintain the stand so trend appears to be fairly stable. The shallow soil is a factor that cannot be changed, but a favorable water year would do much to improve the condition of the sagebrush. At this time, there does not appear to be excessive use by livestock or big game. Due to it's scattered and clumped distribution, the winterfat will always appear to be over utilized. The soil is in poor condition due to the large amounts of unprotected bare ground and lack of litter cover.

1994 TREND ASSESSMENT

The trend for soils has improved slightly since 1986 with the decrease in percent bare ground from 59% to 44% and a significant increase in the sum of nested frequency for western wheatgrass which is highly rhizomatous. The key browse, Wyoming big sagebrush, makes up 96% of the browse cover. It has experienced significant improvements in vigor and a decrease in percent decadence. The density has gone down, which is likely due to the much larger sample size utilized in 1994. The population appears more healthy and vigorous. Trend for browse is stable. The herbaceous understory has noted a slight increase in nested frequency for grasses and forbs. There has been a very significant increase in western wheatgrass. Trend for herbaceous understory is slightly improved. The Desirable Components Index score was good due to good browse cover and moderate perennial grass cover.

TREND ASSESSMENT
soil - slightly up (+1)
browse - stable (0)
herbaceous understory - slightly up (+1)
winter range condition (DC Index) - Good (48) Lower Potential scale

2000 TREND ASSESSMENT

Trend for soil appears to be slightly up with relative bare ground declining from 48% to 35% combined with increased perennial grass cover and nested frequency. Trend for the key browse species, Wyoming big sagebrush is stable, but concern for a future downward trend is warranted. Density has increased slightly from 4,020 plants/acre in 1994 to 4,140 by 2000. However, the proportion of plants in poor vigor has increased from 14% in 1994 to 31%, and percent decadence has gone up from 35% to 69%. Reproduction is poor and 1,240 plants/acre are classified as dying. There is currently not enough young plants to replace the dying shrubs. Use is moderate to heavy but these shrubs are not very vigorous and have limited growth which makes them appear more heavily hedged. The herbaceous understory displays a mixed trend. Cover and frequency of perennial grasses have increased dramatically. The biggest change comes from the significant increase in Indian ricegrass. On the down side, due in part to the dry spring and summer, frequency of perennial forbs has declined. Overall, the herbaceous trend is considered stable. The DCI score remained good but increased in perennial grass cover.

TREND ASSESSMENT
soils - slightly up (+1)
browse - stable (0)
herbaceous understory - stable (0)
winter range condition (DC Index) - Good (60) Lower Potential scale

2005 TREND ASSESSMENT

The trend for soil is stable. The ratio of protective ground cover (vegetation, litter and cryptogams) to bare ground remained nearly identical from 2000 to 2005. The trend for browse is down. The population of the key browse species Wyoming big sagebrush decreased 20% from 2000 to 2005. The percentage of decadent individuals decreased from 69% in 2000 to 50% in 2005, which is still higher than would be desired. Individuals classified as dying decreased from 30% to 13%. With 13% of the population classified as dying and only 2% (in 2005) of population classified as young the density will continue to decline. The trend for herbaceous understory is stable. There were various statistically significant changes in the nested frequency of the individual perennial grass and forb species, but the overall change of the nested frequency of perennial species changed little. Indian ricegrass nested frequency decreased significantly, while needle-and-thread increased significantly. Unfortunately, cheatgrass was sampled on the site for the first time. However, at this time cheatgrass nested frequency and cover were not high enough to change the trend. The DCI score remained good although browse cover and perennial grass cover decreased slightly.

TREND ASSESSMENT
soils - stable (0)
browse - down (-2)
herbaceous understory - stable (0)
winter range condition (DC Index) - Good (58) Lower Potential scale

HERBACEOUS TRENDS --
Management unit 11B, Study no: 7

Type	Species	Nested Frequency				Average Cover %		
		'86	'94	'00	'05	'94	'00	'05
G	Agropyron smithii	a88	c203	c235	b141	2.58	4.73	2.31
G	Bromus tectorum (a)	-	-	-	5	-	-	.01
G	Elymus salina	-	7	6	-	.18	.01	-
G	Oryzopsis hymenoides	a73	a65	b116	a43	1.00	6.86	1.54
G	Poa fendleriana	a14	a8	a2	b30	.01	.03	1.18
G	Poa secunda	a-	a-	a-	b16	-	-	.26
G	Sitanion hystrix	c68	a26	ab30	bc44	.30	.61	1.03
G	Stipa comata	116	79	99	172	1.57	3.81	7.49
Total for Annual Grasses		0	0	0	5	0	0	0.00
Total for Perennial Grasses		359	388	488	446	5.66	16.09	13.84
Total for Grasses		359	388	488	451	5.66	16.09	13.85
F	Antennaria rosea	-	-	11	7	-	.02	.02
F	Arabis sp.	-	7	-	5	.01	-	.01

Type	Species	Nested Frequency				Average Cover %		
		'86	'94	'00	'05	'94	'00	'05
F	Arabis drummondi	$_{b}$20	$_{a}$1	$_{a}$4	$_{a}$-	.00	.01	-
F	Castilleja chromosa	5	1	-	-	.00	-	-
F	Chaenactis douglasii	-	1	-	-	.00	-	-
F	Cryptantha fulvocanescens	$_{b}$48	$_{b}$73	$_{a}$-	$_{a}$7	.65	-	.04
F	Erigeron eatonii	6	1	4	-	.00	.01	-
F	Eriogonum racemosum	-	4	-	-	.01	-	-
F	Hymenoxys acaulis	$_{a}$-	$_{a}$7	$_{b}$18	$_{a}$6	.01	.10	.01
F	Lesquerella sp.	$_{b}$19	$_{ab}$18	$_{a}$7	$_{a}$2	.03	.01	.04
F	Machaeranthera canescens	-	1	-	-	.00	-	-
F	Orobanche sp.	-	-	-	1	-	-	.03
F	Phlox austromontana	$_{b}$144	$_{c}$203	$_{c}$199	$_{a}$22	4.51	5.32	.25
F	Phlox longifolia	-	-	-	1	-	-	.00
F	Polygonum douglasii (a)	-	-	-	4	-	-	.01
F	Schoencrambe linifolia	-	-	-	-	-	-	.00
F	Senecio multilobatus	$_{b}$71	$_{c}$107	$_{a}$3	$_{d}$200	.49	.01	8.01
F	Sphaeralcea coccinea	34	21	30	30	.11	.11	.18
F	Townsendia incana	$_{b}$54	$_{b}$32	$_{a}$5	$_{a}$8	.08	.02	.03
F	Unknown forb-perennial	9	-	-	-	-	-	-
Total for Annual Forbs		0	0	0	4	0	0	0.00
Total for Perennial Forbs		410	477	281	289	5.95	5.63	8.65
Total for Forbs		410	477	281	293	5.95	5.63	8.67

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 11B, Study no: 7

Type	Species	Strip Frequency			Average Cover %		
		'94	'00	'05	'94	'00	'05
B	Artemisia tridentata wyomingensis	85	84	77	14.30	15.89	12.63
B	Ceratoides lanata	3	1	1	-	-	.00
B	Gutierrezia sarothrae	39	27	15	.59	.29	.04
B	Opuntia sp.	3	3	2	-	.00	.00
B	Pinus edulis	0	2	2	.00	.00	-
Total for Browse		130	117	97	14.90	16.20	12.68

CANOPY COVER, LINE INTERCEPT --
Management unit 11B, Study no: 7

Species	Percent Cover '05
Artemisia tridentata wyomingensis	14.26
Gutierrezia sarothrae	.20
Pinus edulis	.23

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 11B, Study no: 7

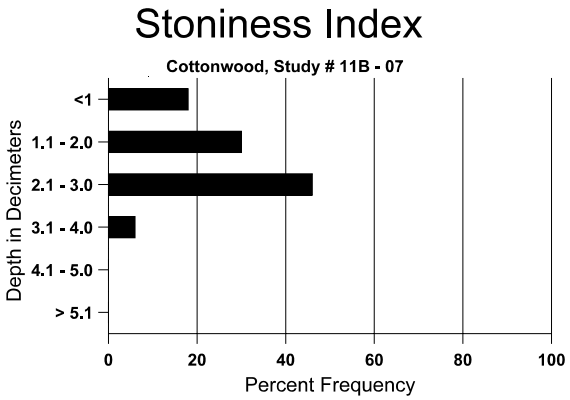
Species	Average leader growth (in) '05
Artemisia tridentata wyomingensis	1.3

BASIC COVER --
Management unit 11B, Study no: 7

Cover Type	Average Cover %			
	'86	'94	'00	'05
Vegetation	4.25	25.72	38.57	30.60
Rock	.75	2.25	1.16	1.72
Pavement	9.00	1.00	1.81	2.21
Litter	25.75	16.70	24.78	21.45
Cryptogams	1.25	2.92	8.11	4.07
Bare Ground	59.00	43.98	40.79	48.02

SOIL ANALYSIS DATA --
Herd Unit 11B, Study # 7, Study Name: Cottonwood

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	ppm P	ppm K	dS/m
13.9	62.4 (15.1)	7.4	42.0	31.4	26.6	2.3	4.6	208.0	0.8



PELLET GROUP DATA --
Management unit 11B, Study no: 7

Type	Quadrat Frequency		
	'94	'00	'05
Rabbit	43	40	47
Grouse	-	-	1
Elk	10	6	24
Deer	10	1	1
Cattle	-	-	1

Days use per acre (ha)	
'00	'05
-	-
-	17/acre
24 (58)	15 (38)
2 (4)	5 (13)
-	2 (5)

BROWSE CHARACTERISTICS --
Management unit 11B, Study no: 7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
86	**5132**	1533	466	1266	3400	-	44	12	66	8	32	24/25
94	**4020**	20	60	2560	1400	580	22	19	35	14	14	22/31
00	**4140**	20	140	1140	2860	1240	29	32	69	30	31	21/32
05	**3320**	80	80	1580	1660	1340	22	3	50	13	13	24/32
Ceratoides lanata												
86	**599**	-	200	266	133	-	11	33	22	3	11	9/6
94	**80**	-	20	60	-	-	0	0	0	-	0	6/5
00	**20**	-	-	20	-	-	0	100	0	-	0	-/-
05	**20**	-	-	20	-	-	0	100	0	-	0	4/4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
86	**599**	400	266	333	-	-	0	0	0	-	0	7/3
94	**2620**	20	40	2420	160	360	0	.76	6	5	5	5/7
00	**1680**	-	200	1480	-	-	0	0	0	-	0	3/4
05	**440**	-	20	420	-	-	0	0	0	-	0	8/9
Opuntia sp.												
86	**200**	-	200	-	-	-	0	0	0	-	0	-/-
94	**140**	20	-	100	40	20	0	57	29	29	57	2/5
00	**60**	-	20	40	-	-	0	0	0	-	0	3/6
05	**60**	-	-	60	-	-	0	0	0	-	0	3/9
Pinus edulis												
86	**66**	-	66	-	-	-	0	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
00	**40**	-	40	-	-	-	0	0	-	-	0	-/-
05	**40**	-	40	-	-	-	0	0	-	-	0	-/-